CHEMICALS

Project Fact Sheet

METHOD OF INSPECTING ON-STREAM PROCESS PIPING AT SUPPORT AREAS FOR REFINERIES AND CHEMICAL PLANTS

TECHNOLOGY DETERMINES PIPE WALL THICKNESS, SUBSTANTIALLY REDUCING COSTS FROM DOWNTIME

Benefits

- Annual energy savings of 48 billion Btu is expected from each facility inspected.
- Near elimination of 22 tons of VOC/year from an average facility
- Total potential annual energy savings could be 1.05 trillion Btu by 2010 from 22 annual refinery inspections.
- Many chemical plants could also save energy and reduce VOC emissions with ultrasound inspections.

Applications

The petroleum refining and chemical manufacturing industries will benefit greatly from this novel way to keep a check on problems created by corroding pipes used in processing.

Project Partners

NICE³ Program
Washington, DC

Texas Natural Resource Conservation Commission
Austin, TX

Tubular Ultrasound, L.P.
Houston, TX

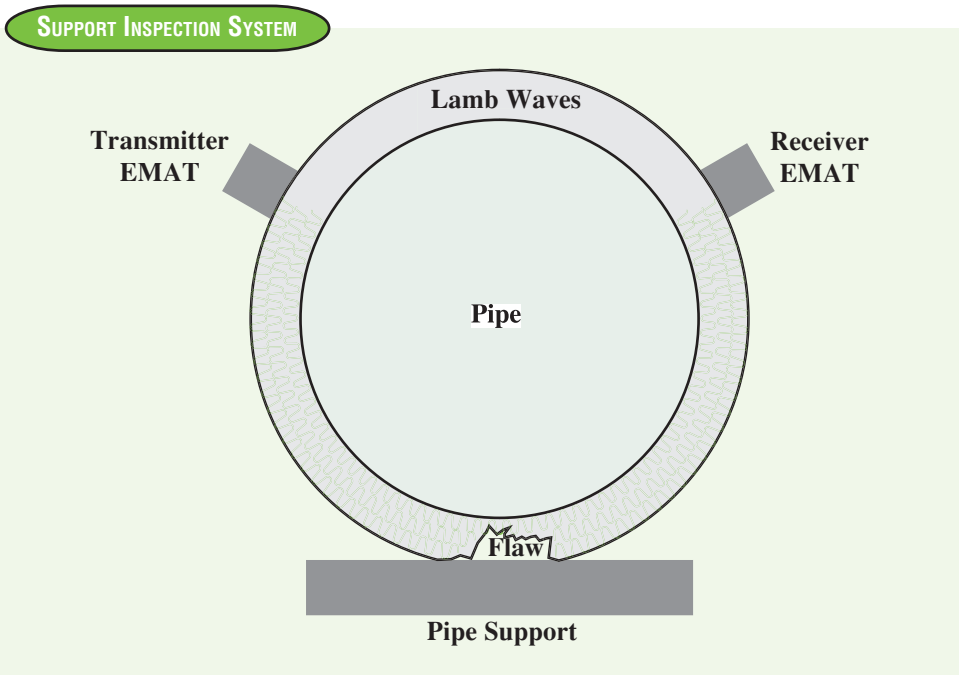
DuPont Corporation
Wilmington, DE

Exxon/Mobil Company
Chalmette, LA

Weld Inspection Systems, Inc.
Albuquerque, NM

Traditionally, inspections of piping at critical support areas must be conducted off-line, creating costly shutdowns of critical equipment and processes. Pipe must be cut and lifted with cranes to take spot wall thickness readings around pipe supports. The lifting of extremely corroded pipe causes ruptures or further weakening. When pipe faults have not been located in a timely manner, leaking or ruptured pipe produces fugitive emissions. Each year, a typical refinery with 700 miles of pipe will leak nearly 22 tons of volatile organic compounds (VOCs).

Tubular Ultrasound, with assistance from the U.S. Department of Energy's NICE³ Program, the Texas Natural Resource Conservation Commission, Weld Inspection Systems, Inc., DuPont Corporation, Exxon/Mobil Company, and Shell Oil Company, is demonstrating the Support Inspection® system for refineries and chemical manufacturing plants. This novel system is the first one capable of performing rapid, on-stream, quantitative examinations of pipe support areas where leaks or system ruptures often occur.



Tubular Ultrasound Support Inspection system sends and receives uniquely designed ultrasonic waves that measure the thickness of process piping, including sections of pipe around support areas. Readings are taken without having to shut down refining or processing operations, resulting in substantial energy and waste savings.

The Support Inspection system does not require systems to be shut down or pipe located near support areas to be physically removed. Instead, unique ultrasonic waves are launched circumferentially around the pipe. The waves are then measured to determine pipe integrity and to detect places where pipe walls have lost thickness. Leaks, catastrophic line failures, and costly shut-downs are dramatically reduced.

Project Description

Goal: Demonstrate the Support Inspection system, which allows refiners and chemical processors to inspect piping at critical support areas without interrupting plant operations. Demonstrations will be conducted at both petroleum and chemical facilities.

The system uses electro-magnetic acoustic transducers (EMATs). EMATs are non-contact, couplant-free, ultrasonic transducers that use a combination of magnetic waves and high-current tone bursts to generate ultrasonic Lamb waves. The waves are sent circumferentially around the pipe, allowing wall thickness to be read throughout the pipe without interrupting plant production. The Lamb waves move axially down the pipe, allowing for a complete volumetric inspection, including inaccessible areas where pipe is held by a supporting structure. Corrosive wall loss in processing pipe occurs most frequently at support areas because of stresses, electrolytic action, and trapped moisture. Changes in the mode and velocity of Lamb waves indicate wall thinning in the pipe that is easily detected by monitoring the amplitude of the wave. The reading is converted into a direct reading of wall loss at a specific location. The Support Inspection system is one of the first quantitative applications of EMAT ultrasonic wave theory, whereby wall loss conditions are actually evaluated for severity without having direct access to the pipe surface.

Progress and Milestones

- Prepare pre-demonstration electronics and mechanical equipment.
- Prepare pre-demonstration software.
- Conduct technical demonstration.
- Conduct commercialization activities.
- Submit final report.
- Report on commercialization activities.

Economics and Commercial Potential

This technology could save 35 billion Btu of electricity and 13 billion Btu of gas per inspection. First inspections using the technology are expected by 2005. Based on 18% market penetration by 2010, annual savings could be 1.05 trillion Btu with 22 facilities being inspected annually. Market penetration of 54% by 2020 could save 3.6 trillion Btu from 77 refineries.

NICE³ – National Industrial Competitiveness through Energy, Environment, and Economics:
An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry.
This grant program provides funding to state and industry partnerships for projects that demonstrate advances in energy efficiency and clean production technologies. Awardees receive a one-time grant of up to $525,000. Grants fund up to 50% of total project cost for up to 3 years.

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